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**Analysis
of the Impact
of
800 MHz Rebanding**

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EXECUTIVE SUMMARY

Last year the Federal Communications Commission (“FCC”) issued two orders in its long pending effort to address the ongoing and growing problem of interference to public safety operations in the 800 MHz Private Land Mobile Radio Band (“PLMRB” or “Band”) from Nextel Communications, Inc. and its affiliates (“Nextel”) and to some extent from cellular operations in the upper portion of the *Band* (“FCC Orders”). The plan adopted in the *FCC Orders* involves relocating some of the frequencies used for public safety, business industrial and land transportation (“B/ILT”) and commercial Specialized Mobile Radio (“SMR”) operations in the band. The FCC issued SMR licenses through two methods: (1) site-specific licenses, and (2) BEA based auctioned spectrum

The Consensus Parties proposal, which was the basis for the *FCC Orders* and the *Orders* themselves, were based primarily on the assumption that *Nextel* owned or controlled most, if not all, of the 800 MHz SMR spectrum in every Basic Economic Area (“BEA”) market or City. What the plan failed to take into consideration is that in many markets site-specific and *BEA* licenses occupy the same channels. Therefore, *Nextel*’s relinquishment of a channel still can leave incumbent site-specific channels to remain which can preclude other site-specific licensees from occupying a channel without being at a sufficient distance separation to mitigate co-channel interference.

Concepts To Operations, Inc. (“CTO”) has examined the impact of the *FCC Orders* when applied to specific markets and Cities using official license data obtained from the *FCC* database. The purpose of the analysis was to provide the following:

1. An engineering analysis of the impact of the plan adopted by the *FCC Orders*. To our knowledge no such analysis was performed by *Nextel* or the *FCC* and was made available for public comments considering the magnitude of the undertaking.
2. Confirmation that the following results claimed in the *FCC Orders* are valid:
 - A. There is sufficient spectrum to accommodate every licensee affected by the relocation.
 - B. Each such licensee can be provided “comparable facilities” including “coextensive geographical coverage”.
 - C. There is sufficient spectrum available after implementing the plan to support public safety receiving an average of an additional 2.5 MHz of 800 MHz spectrum.
 - D. Day-to-day public safety operations, including regional interoperability, will not be disrupted due to rebanding.

The report is based on license data obtained directly from the *FCC* database as of June 30, 2005. These data were the best currently available to *CTO*. Using the relocation rules set forth in the *FCC Orders*, *CTO* reviewed the implication of rebanding in 578 Cities in the U.S. and its territories with a population of 50,000 or greater (“*Cities*” or, individually, “*City*”).

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The methodology used for calculating spectrum surplus or deficit, considering co-channel geographic distance, measured in terms of available 800 MHz *Band* channels, in each *City* examined was as follows.

CTO determined the number of:

- Non-*Nextel* and non-Southern LINC (“*Southern*”) site-specific channels within channels 001-120 and 401-600 that would be relocated to channels 121-400 within (a) thirty-five (35), (b) fifty (50), and (c) seventy (70) mile radius of each *City* center; and
- Non-*Nextel* site-specific channels that would remain within channels 121-400 within the three radii set forth above from the *City* centers.

Then *CTO* calculated the channel movement, based again on the *FCC Orders*, to determine Channel surplus or deficit. This was measured in each *City* using the following method;

- A. Consider channels 001-120 and the National Public Safety Planning Advisory Committee (“*NPSNAC*”) channels (channels 601-720) exchange a wash numerically;
- B. Calculate the number of incumbent licensed channels in channels 121-400, that remain in place after *Nextel* and *Southern* vacate this spectrum;
- C. Calculate the number of additional licensed channels that are to relocate into channels 121-400 from channels 001-120 and 401-600;
- D. Add Categories B and C to obtain the total number of channels that require accommodation; and
- E. Subtract the resulting number from 280 (the maximum number of channels that are within channels 121-400) to obtain the number of surplus or deficit channels after *Nextel* and *Southern* vacate.

This channel calculation was conducted on 578 Cities in the U.S. and its territories and the resulting analysis supports the following conclusions:

- A. *Nextel* lacks sufficient channels within channels 121-400 to accommodate every non-*Nextel* site-based licensee affected by the relocation. In addition in the *ESMR* block there is insufficient spectrum to accommodate all *BEA* licensees,
- B. Contrary to claims, the *Rebanding Orders* do not provide each licensee with “comparable facilities” including “coextensive geographical coverage”,
- C. There is not sufficient spectrum available after rebanding to support public safety receiving an additional 2.5 MHz of 800 MHz spectrum in every *City*. In fact in 11 of the largest 100 *Cities* public safety actually could lose spectrum, and
- D. Day-to-day public safety operations, including regional interoperability, cannot be maintained unless simultaneous frequency reconfiguration of involved public safety agencies occurs.

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Using a 35-mile radius from the center of the 578 Cities, the 280 channels within channels 121-400 are insufficient to accommodate the reconfiguration of site-specific channels in some one of these Cities. For example:

Boston, MA: There are 206 incumbent channels licensed in channels 121-400 that will remain in place post rebanding. In addition, 193 licensed channels will be required to relocate into channels 121-400. The 206 incumbent channels added to 193 relocating channels equals 399 channels. The 280 channels available in channels 121-400, minus 399, equal a deficit of 119 channels that cannot meet the 70-mile requirement for co-channel separation. This means 119 channels owned by various licensees cannot be accommodated in Boston. Furthermore, many of these channels are licensed to public safety agencies (e.g., police, fire, EMS). In addition, Cities near to Boston that are in Massachusetts, Rhode Island and New Hampshire will also have a spectrum shortage of between 35% and nearly 50% of the spectrum allocated for relocation of high-site licensees by the FCC.

Miami, FL: There are 227 incumbent channels licensed in channels 121-400 who will remain in place post rebanding. In addition, 159 licensed channels will be required to relocate into channels 121-400. The 227 incumbent channels added to 159 relocating channels equals 386 channels. The 280 channels available in channels 121-400, minus 386, equal a deficit of 106 channels that cannot meet the 70-mile requirement for co-channel separation. This means 106 channels licensed to various entities cannot be accommodated in Miami. Again many of these channels are licensed to public safety agencies. A similar overall shortage would also occur in Cities near Miami.

In 24 of the 100 largest U.S. Cities there is not sufficient spectrum being vacated by *Nextel* and *Southern* to allow public safety the additional 2.5 MHz of 800 MHz and in 11 of those cities, public safety could actually loose spectrum.

Under the rebanding plan, the upper portion of the band (channels 441 and above) is to be used by “cellular-like” low-site Enhanced Specialized Mobile Radio (“ESMR”) systems. The *CTO* analysis found that the 280 channels set aside (not including the 40 channel Guard Band channels 401-440) cannot accommodate the 430 BEA channels purchased in the spectrum auctions. This does not allow for “comparable facilities” to be granted to non-*Nextel* and non-*Southern* licensees in many *BEAs*. The problem is further exacerbated when the former *NPSFAC* channels (channels 601-720) and 10 MHz of the 1.9 GHz are exclusively reserved for *Nextel*.

Based on the conclusions the following recommendations are presented to accomplish rebanding.

With respect to the high-site portion of the band:

- A. The frequency boundary between the non-Cellular Block and ESMR portions of the revamped 800 MHz band should be flexible and allow for accommodation of all existing site-specific licensees. The Commission should amend the plan adopted in the *Rebanding Orders* to require coordination for the licensed channels to be relocated to

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ensure that co-channel interference will not be a problem after band reconfiguration. The Commission, therefore, should grant APCO International, Inc.'s Petition for Partial Reconsideration.

- B. To provide "comparable facilities" including "coextensive geographic coverage" a system-by-system examination, comparing present and reconfigured systems, must be made. The additional channels obtained by the flexible boundaries should allow for provision of "comparable facilities".
- C. Based on the above recommendations, although solving the spectrum shortage for the 11 Cities on the top 100, an additional 2.5 MHz can only be obtained by further moving the boundary into the present *ESMR* portion of the band.
- D. Frequency reconfiguration of agencies requiring regional interoperability should occur simultaneously.

With regard to the *ESMR* portion of the band:

- A. Where the boundaries became flexible to accommodate site-specific licensees, granting of channels 601-720 exclusively to *Nextel* should not occur,
- B. The non-*Nextel* non-*Southern BEA* licenses should be allowed to be accommodated above the revised lower frequency boundary in the entire *ESMR* portion of the band (including channels 601-720) and in the 1.9 GHz band as necessary to provide "comparable facilities" and "coextensive geographic coverage".

The results of the *CTO* analysis for each City and the *BEAs* examined are reflected in the Detailed Analysis which follows.

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DETAILED ANALYSIS

Concepts To Operations, Inc. is a telecommunications and information systems engineering and consulting firm that has been in business since 1990 and *CTO*'s qualifications are a matter of record with the *FCC* and *NTIA*. *CTO*'s engineers have had experience ranging from 11 to 54 years. *CTO*'s engineering expertise includes both Federal Government and non-Federal radio spectrum management and radio engineering, particularly land mobile radio, both commercial and public safety. *CTO* engineers have served as members of FCC Advisory Committees. *CTO* has participated in and is on record in many FCC filings and proceedings and has been active in APCO and NENA activities and initiatives. In addition, from the beginning *CTO*, on behalf of its public safety as well as commercial clients, has actively participated and has provided advice and analyses concerning the FCC's reconfiguration of the 800 MHz band ("Rebanding Proceeding"), including input and data to be used in various filings in this proceeding. This advice and analysis has included an assessment of the requirements and impact of the two FCC orders adopting a specific reconfiguration process for the 800 MHz Band.¹ *CTO* provided a Rebanding Cost Analysis which concluded that the real cost associated with rebanding is approximately \$3.5 Billion rather than under \$1.0 Billion. The *FCC* ultimately required Nextel to place a \$2.8 Billion letter of credit.

In November of 2004, *CTO* prepared an analysis of the relocation of public safety, non-Nextel SMR and B/ILT licenses in portions of the 800 MHz band (specifically Channels 001-150 and 401-600) under the Commission's *Initial Report and Order*. That analysis raised serious questions about the sufficiency of available spectrum to accommodate certain public safety, SMR and B/ILT licensees that were required, under the terms of the *Initial Report and Order*, to be relocated to Channels 151-400 as part of the rebanding process. To *CTO*'s knowledge, the concerns reflected in that report remain unrefuted.

CTO has conducted a further, extensive two part review of the impact of the *Rebanding Orders* on relocation of commercial and public safety licensees.²

¹ *In the Matter of Improving Public Safety Communications in the 800 MHz Band, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, 19 FCC Rcd. 14969 (2004), as amended by *Erratum*, released September 10, 2004, *Erratum*, DA 04-3208, 19 FCC Rcd. 19651 and *Erratum*, DA 04-3459, released October 29, 2004, *recon. and appeal pending* ("Initial Report and Order"); *Supplemental Order and Order On Reconsideration*, 19 FCC Rcd. 25120 (2004), *recon. and appeal pending* ("Supplemental Order") (collectively, "Rebanding Orders").

² In this analysis *CTO* has used the existing numbers for channels 001-600 and have used and numbered 25 kHz channels above 600. These channel numbers are continued in the rebanded spectrum rather than the new FCC channel numbers for clarity.

METHODOLOGY

In developing this Report, CTO downloaded the FCC's Public Land Mobile Radio Band ("PLMRB") database as of June 30, 2005.

CTO initially determined the identity and location of the five hundred seventy-eight (578) Cities in the U.S. and its territories with a population of 50,000 or greater. CTO then determined the number of:

1. Non-Nextel and non-Southern site-specific channels within channels 001-120 and 401-600 that would be relocated (see **Figure 1** for 800 MHz Band Relocation Plan) to channels 121-400 within (a) thirty-five (35), (b) fifty (50), and (c) seventy (70) mile radius of each of the City centers; and
2. Non-Nextel site-specific channels that would remain within channels 121-400 within the three radii set forth above from the City centers.

FIGURE 1

Channels MHz	001-120	121-360		361-400	401-440	441-600	601-720	
Move	806	809	809.7375	815	816	817	821	824
	Stay	Stay	Election	Move	Stay	Move		
700 MHz Public Safety Band	General Category 150 Channels 7.5 MHz	Interleaved spectrum 80 SMR, 50 Business, 50 Industrial 70 Public Safety 250 Channels 12.5 MHz		ESMR Block 200 Channels 10 MHz	NPSPAC Public Safety 230 Chan 6 MHz		Cellular A & B	Current Channel Plan
MHz	851	854	854.7375	860	861	862	866	869
MHz	806	809	809.7375	815	816	817	821	824
700 MHz Public Safety Band	NPSPAC Public Safety 230 Chan 6 MHz	Public Safety, Hi Site SMR, Bus, Industrial 280 Channels 14 MHz	Expansion Band*	Guard Band**	Cellular Like ESMR Block 280 Channels 4 MHz		Cellular A & B	FCC's Final Plan
MHz	851	854	854.7375	860	861	862	866	869
* No public safety system will be required to remain in or relocate to the expansion band; although they may do so if they choose.				** No public safety or (Critical Infrastructure & Industry) CII licensee may be involuntarily relocated to occupy the Guard Band.				

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The FCC's rules require co-channel coordination of site-specific licenses whose base stations are within 70 miles of each other. We therefore initially determined which licenses would remain or be relocated within a 35-mile radius of each City center. Any license within this radius from a particular City's center generally would preclude use of such frequency within 70 miles of the first licensee's channel. Thus, a 70-mile radius circle with its center at any given point:

1. on the circumference of; or
2. within the thirty-five (35) mile radius circle from a particular City's center encompasses the entire thirty-five (35) mile radius circle and precludes the use of the co-channel within that circle.

Further, location of a base station at a 70 miles distance from the center of a City will require coordination with existing stations that are at or within a 70 mile radius of the City center. Thus the 50 and 70 mile radii circle used provide an indication of additional channels for which coordination is required. This is illustrated in **Figures 2, 3 and 4**.

FIGURE 2 shows the required 70-mile coordination distance for a co-channel at a site on the circumference of 35-mile radius circle centered at the center of a City. The 70-mile radius circle encompasses the entire 35-mile radius circle which shows that coordination is required for any site located within the 35-mile circle.

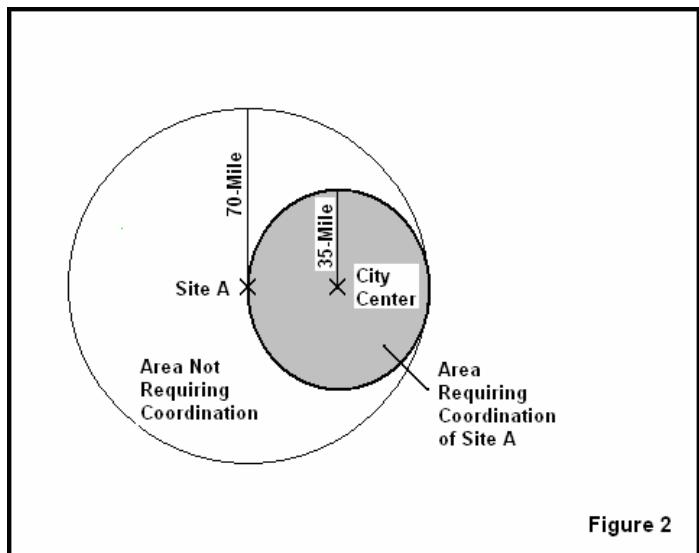


Figure 2

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FIGURE 3 shows the 70-mile coordination distance with a site located on the circumference of 50-mile radius circle centered at the center of a City. Only a portion of the 50-mile circle requires coordination.

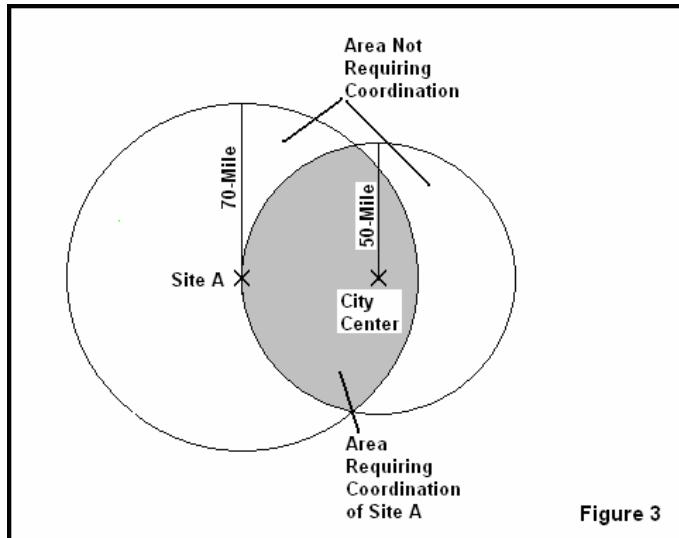


Figure 3

FIGURE 4 shows the 70-mile coordination distance with a site located on the circumference of a site at a 70 mile radius circle centered at City center. Coordination is required for an even smaller portion of this circle.

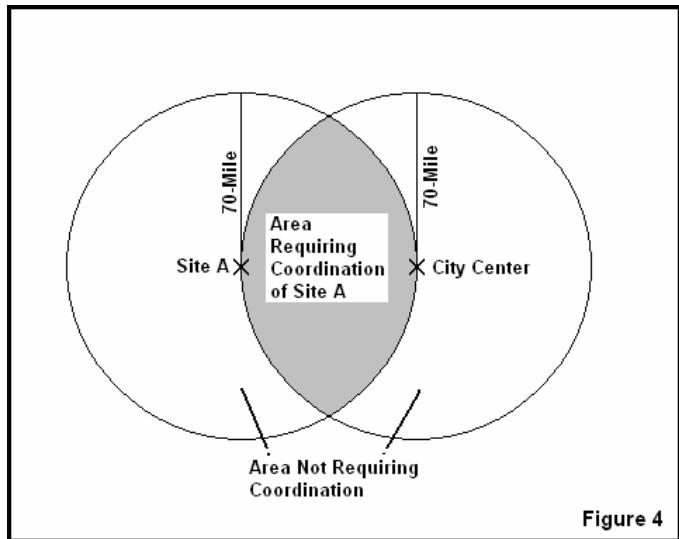


Figure 4

CTO then determined whether the vacated Nextel BEA and site licensed channels and the vacant channels in channels 121-400 within the three radii set forth above from a particular City center are sufficient for the *Rebanding Orders* to provide the relocated public safety and non-Nextel and non-Southern site-specific SMR, B/ILT licensees with "comparable facilities".

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CTO then performed a similar analysis for the ESMR portion of the band, channels 400-720, based on BEAs.

First, CTO examined the required high-site relocations, considering site specific license channels that are to remain in or be relocated to frequencies between 806/851 and 816/861 MHz (channels 001 to 400) within several circles of different radii from the center of the Cities. The purpose of the analysis is to determine if there are a sufficient number of channels in this portion of the 800 MHz band to accommodate and provide "comparable facilities" to these licensees. This portion of the band has 400 channels including a 40 channel "Expansion Band" (channels 361-400) in the upper portion.

Second, CTO examined the upper portion of the 800 MHz band between 816/861 and 824/869 MHz (channels 401 to 720) that is to be used for ESMR systems. This portion of the band contains 320 channels including a 40 channel "Guard Band" (channels 401-440). This portion of the analysis was done on a BEA basis rather than a City basis because this conforms to the manner in which licenses were auctioned by the FCC.

1. Spectrum Availability For Relocation Of Certain Public Safety, SMR and B/ILT Licensees To Comparable Facilities

CTO initially investigated the availability of spectrum in the 806/851 to 816/861 MHz band (channels 001–400), which is to support and provide "comparable facilities" to public safety, SMR, and B/ILT licensees after rebanding occurs. This portion of the 800 MHz band, which contains 400 duplex channels, must accommodate present non-Nextel and non-Southern users, such users from channels 001–120, and such users holding site-specific channels in channels 401–600. Nextel and Southern are to relocate from channels 001–400 to make spectrum available to those present and relocated channels. Nextel and Southern also must vacate channels 401–440 (the Guard Band). The public safety licensees presently in the NPSPAC portion of the band (821/866–824/869 MHz) (channels 601-720) are to relocate to 806/851–809/834 MHz (channels 001-120) the 120 channels vacated by other licensees.

The FCC requires co-channel coordination of licensees whose base stations are within 70 miles of each other. This first part of our analysis initially used a circle of a 35-mile radius around each City, which was examined to determine which channels would remain or be relocated in this circle. Any of these located within the 35-mile radius circle generally would preclude the use of a co-channel licensee's frequency within 70 miles of the first licensee's channel. Thus a 70-mile radius circle with its center at any given point on the circumference of or within the 35-mile radius circle would encompass the entire 35-mile radius circle and preclude the use of the channel unless an engineering study can show that co-channel interference will not occur, because of terrain shielding, use of directional antennas and/or reduced power.

TABLE 1 shows (for selected Cities) the City and state examined, the non-Nextel/non-Southern site-specific incumbents licensed for channels 121–400 within 35 miles of the City center and those non-Nextel/non-Southern site-specific channels licensed on channels 001–120, and channels 401–600. There are 280 channels within channels 121–400.

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If the site-specific channels presently within channels 121–400 and those to be relocated to channels 121–400 exceed 280 then a spectrum or channel deficit exists and some of the site-specific channels cannot be accommodated in the 280 channels between 121–400. The following sample reflects the significant channel deficits found in BEA's 3 (including Boston), 31 (including Miami), and 174 (including major Cities in Puerto Rico).

For example, Boston, MA, the largest City in BEA 3, has 206 site-specific non-Nextel/non-Southern incumbent channels within a 35-mile radius of the City center. In addition, 73 non-Nextel/non-Southern site-specific incumbent channels relocating from channels 001–120, and 120 channels relocating from channels 401–600 are to be accommodated. The total requirement is 399 channels, but since there are only 280 channels, 119 incumbent site-specific licensed channels cannot be accommodated, which is the deficit as shown. Similarly, for Miami, FL the largest City in BEA 31, a deficit of 106 channels exists.

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TABLE 1: SELECTED CITIES WITH CHANNEL DEFICIT

City Name	BEA #	Non-Nextel/Non-Southern Site-Specific Incumbent Channels within	Non-Nextel/Non-Southern Site-Specific Channels to Move-in within		Site-Specific Channel Deficit within
		35-mile radius *	35-mile radius *		35-mile radius *
		Chan 121-400	Chan 001-120	Chan 401-600	Chan 121-400
Pawtucket, RI	3	213	83	123	(139)
Taunton, MA	3	208	83	123	(134)
Brockton, MA	3	212	80	120	(132)
Quincy, MA	3	212	78	120	(130)
Providence, RI	3	207	77	123	(127)
Newton, MA	3	211	74	120	(125)
Lowell, MA	3	210	71	120	(121)
Boston, MA	3	206	73	120	(119)
Cambridge, MA	3	203	73	120	(116)
Waltham, MA	3	205	71	120	(116)
Cranston, RI	3	197	75	123	(115)
Lawrence, MA	3	202	67	124	(113)
Malden, MA	3	200	72	120	(112)
Medford, MA	3	200	72	120	(112)
Somerville, MA	3	198	71	120	(109)
Haverhill, MA	3	196	67	124	(107)
Nashua, NH	3	195	68	119	(102)
Lynn, MA	3	192	68	120	(100)
Fall River, MA	3	178	78	123	(99)
Warwick, RI	3	165	72	123	(80)
New Bedford, MA	3	145	62	123	(50)
Manchester, NH	3	132	51	119	(22)
Hollywood, FL	31	232	85	79	(116)
Pembroke Pines, FL	31	232	85	79	(116)
Miramar, FL	31	232	84	79	(115)
Hialeah, FL	31	227	83	79	(109)
North Miami, FL	31	227	83	79	(109)
Miami Beach, FL	31	227	81	79	(107)
Miami, FL	31	227	80	79	(106)
Coral Springs, FL	31	181	90	10	(1)
Margate, FL	31	181	90	10	(1)
Pompano Beach, FL	31	181	90	10	(1)
Bayamon, PR	174	176	57	134	(87)
Guaynabo, PR	174	176	56	134	(86)
Caguas, PR	174	173	56	134	(83)
San Juan, PR	174	173	56	134	(83)
Carolina, PR	174	154	56	114	(44)
Ponce, PR	174	148	62	99	(29)

* From center of City.

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As another example one non-Nextel/non-Southern licensee holds both the BEA authorizations (125 channels), which were acquired during FCC auction No. 34, and site-specific channel licenses in the Puerto Rico BEA market. Using the methods described above, **TABLE 1** shows that for six (6) Cities in Puerto Rico (BEA 174) a deficit ranging from 29 to 87 channels exists for site-specific licenses. The conclusion is that this licensee's channels cannot be accommodated in the Puerto Rico BEA because the relocations, due to rebanding, cannot even accommodate the existing non-Nextel/non-Southern site-specific licensed channels, let alone these 125 BEA licensed channels.

In the cases of Boston, Miami and Puerto Rico, much of the 35-mile radius circle covers water, where licensed channels will not be located. Thus, the density of licensed channels will be increased in the land areas. In such cases only a portion of the 35-mile radius will contain the licensed site-specific channels and the 70-mile distance required for interference protection would only need to cover land areas rather than the 35-mile radius around the Cities centers. This, in effect, means that the center of a 70-mile radius circle can be further away from the center of the City to preclude the use of a channel or can preclude use in a portion of the area surrounding the City center.

In order to account for this deficit, determinations were made for 50-mile and 70-mile radius circles. These are shown along with the 35-mile circle deficit (see Figures 1, 2, and 3). The data are shown in **TABLE 2** as an exhibit for all Cities with a population of 50,000 or more within all BEA's. These data are current as of June 30, 2005. Regarding elections in BEA's, for example, only one (1) licensee in BEA 003 (Boston, Worcester, Lawrence, Lowell, and Brockton) elected to move ten (10) channels from the Interleaved Band (channels 121-360) to the Guard Band (channels 401-440). This would only reduce the site-specific deficit by ten (10) channels, leaving deficits ranging from 12 to 129 channels for various Cities in the BEA within channels 121-400. Several other BEA licensees have elected to move to the Guard Band involving BEA's 113, 114, 092, and 002. In these BEA's there is no site-specific channel deficit even before the requested election. One (1) site-specific licensee has also elected to move to the Guard Band.

In addition to the incumbents, any non-Nextel BEA license that does not qualify as an ESMR would also need to be accommodated in channels 121-400, which may reduce the channel surplus in many of the Cities. In cases with only a small surplus this may result in a channel deficit. In cases where a deficit has been found; the deficit could increase due to inclusion of non-ESMR BEA licenses.

Considering Miami and the surrounding Cities, one BEA license of five (5) channels exists but cannot meet the ESMR criteria specified in the Orders.³ Thus it must be relocated in channels 121-400 and might raise the deficit by five (5) channels. For Miami the deficit may rise from 106 to 111 channels.

³ In the Initial Report and Order, the Commission defines cellular like systems as "a system having more than five overlapping interactive sites featuring hand-off capability; and any one of such sites has an antenna height of less than 100 feet above ground level with an antenna height above average terrain (HAAT) of less than 500 feet and more than twenty paired frequencies." Id., at ¶ 172.

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Note that the Cities within the Southern area and the areas bordering Canada and Mexico have been treated in the same manner as used in the rest of the areas analyzed. These areas require different relocation considerations, which were not included in the analysis. The analysis also did not take into account the differences because of the use of narrow channel spacing in California.

Furthermore, rebanding is intended to separate the low-site ESMR portion of the band from the high-site (non-ESMR) portion in order to reduce adjacent channel and intermodulation interference to public safety. However, the relocation and retention of high-site SMR and B/ILT licensees in channels 001–400 can also produce unacceptable adjacent channel and intermodulation interference to public safety systems operating in that portion of the 800 MHz band.

Although some transmissions are of short duration, those systems that are trunked have continuous transmissions on the control channel. Also, systems for mobile data operations are transmitting most of the time. Both types of signals can cause unacceptable adjacent channel interference and can also, in combination with other transmissions, cause unacceptable intermodulation interference.

Attention must be paid to the frequency assignment of all relocated systems to ensure that interference is minimized particularly in high density environments. Additional filters and other interference suppression equipment can also be necessary. These are costs which Nextel has no obligation to reimburse to those licensees being relocated or remaining.

Interoperability has been cited as a requirement for public safety communications. A sufficient number of channels must be made available to be used for interoperability whether it involves communications between agencies within a jurisdiction or between agencies of different jurisdictions. The events of 9/11, the recent hurricanes in Louisiana, Mississippi and Texas and the forest fires in California underscore the need for interoperable communications.

The Orders point to retuning and reprogramming mobile and portable equipment as part of the reconfiguration process. If this does not occur simultaneously for all public safety systems which require communication during emergencies, interoperability can not occur. If an emergency occurs during the reconfiguration process the consequences of not having full interoperability can cost lives. Thus, public safety systems of cooperating jurisdictions must be reconfigured simultaneously.

This situation can be even more serious when cooperating agencies are in different reconfiguration waves.

The Transition Administrator (“TA”) has stated that they will provide a Frequency Proposal Report (“FPR”) containing new frequencies proposed for each reconfiguring frequency. The TA states that these “...will have no co-channel licensees and locations that are not in compliance with FCC short-spacing rules...” The short-spacing rules require a minimum separation of 55 miles if reduced antenna height above average terrain and lower than maximum authorized effective radiated power of the short-spaced station is used. Where deficits or small surpluses in channels 121-400

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(see Table 2) have been found, it is extremely unlikely that the coverage area of relocating channels can be retained to provide comparable “coextensive geographic coverage”.

Based on the short-spacing 55-mile coordination requirement on examination was made of Boston and Miami assuming that all licensees use lower power and/or antenna height that allow for short spacing.

For Boston within 27.5 miles of the center of the City there are 182 incumbent channels within channels 121 to 400. These and the incumbent 63 channels in channels 001 to 120 and the 120 incumbent channels in channels 401 to 600 that would both relocate to channels 121 to 400 leaves a deficit of 85 channels.

For Miami there are 222 incumbent channels in channel 121-400 within 27.5 miles of the center of the City. This plus 77 incumbents in channels 001 to 120 and 79 incumbents in channels 401 to 600 that would relocate to channels 121 to 400 results in a deficit of 98 channels.

Thus, even if all incumbents were short-spaced in either of these Cities a channel deficit would exist after rebanding occurs.

It has been stated that rebanding will provide additional spectrum to Public Safety. “...Nextel states that through its relinquishment of 800 MHz General Category and interleaved spectrum, it is giving up an average of 8.5 megahertz of bandwidth, resulting in an average net gain of 2.5 megahertz to public safety. Combined with the two megahertz of spectrum that Nextel is giving up from its spectrum holdings in the Upper 200 block, the average net amount of spectrum being relinquished by Nextel is 4.5 megahertz.”⁴

TABLE-2 shows the deficit or surplus of channels which includes use of the Interleaved (channels 121-360) and Expansion (channels 361-400) Bands. This table includes non-Nextel incumbent channels that will remain in these Bands. These incumbent licensed channels preclude the use of the channels by others generally within a 35-mile radius of the Cities examined and in some cases within a 70-mile radius of the Cities.

Considering only the 35-mile radius case, 418 out of 578 or 72.3% of the Cities would be able to use all of the 2.5 MHz for public safety operations. The analysis did not take into account the Southern area and the Canadian and Mexican border areas difference in the relocation plans. However, the analysis does show that in many cities considerably less spectrum is available to public safety than the additional 2.5 MHz that was contemplated by the *Rebanding Orders*. Over twenty-five percent (25%) of the Cities would not have full use and some of these Cities would not have use of any of the 2.5 MHz of spectrum available for public safety use.

Using the 35-mile radius, CTO found that in the 100 largest Cities, in terms of population, 24 Cities cannot use the full 2.5 MHz because of incumbent licensees. Of these 24 Cities, 11 cannot have access to any of the 2.5 MHz vacated by Nextel because of non-Nextel incumbents remaining

⁴ See FCC 04-168, paragraph 307.

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in the area. As noted previously, Boston, MA, San Juan, PR, and Miami, FL have deficits of channels and can use none of the 2.5 MHz. But New York, NY can only use 1.6 MHz or 64% of the 2.5 MHz for public safety. Similarly, Memphis, TN can only use 1.1 MHz or 44% of the 2.5 MHz; Las Vegas, NV can only use 1.55 MHz or 62% while Minneapolis, MN, Anchorage, AK, and Greensboro, NC can use none of the 2.5 MHz for public safety.

Regarding the two (2) MHz from the holdings that Nextel is giving up in the Upper 200 Block, this forms the Guard Band (channels 401-440). If public safety were to use these channels they could be subject to the same type of interference problems that resulted in the interference mitigation steps taken in the *Initial Report and Order*.

Yet many of these large Cities have the greatest need for additional public safety spectrum.

2. Spectrum Availability For Relocation of BEA Licensees To Comparable Facilities

In the second part of its analysis CTO examined the relocation requirements specified by the FCC in the *Rebanding Orders* for BEA licenses obtained during the FCC's auctions. The ESMR licensed channels are to stay in or relocate to channels within the frequency range 817/862–824/869 MHz (channels 441–720). The present NPSPAC public safety channels in the range 821/866–824/869 MHz (channels 601–720) are to be vacated by public safety and relocated 15 MHz below present frequency assignments. This vacated portion of the band, containing 120 channels, is to be used by Nextel and/or Southern to relocate channels from below 817/862 MHz (channels 440 and below). In addition, 10 MHz of the 1.9 GHz band is to be made available to Nextel for use in its operations.

Simply put, 430 channels were purchased by BEA licensees in each of the 175 BEA markets during the FCC auctions and only 280 channels (not including the 40 channel Guard Band) are to be made available in the 800 MHz band to accommodate them. Nextel is given preference in rebanding, which allows them exclusive use of the top 120 channels (6 MHz) in the 800 MHz band and the full 10 MHz in the 1.9 GHz band. The remaining channels in the 800 MHz band available for non-Nextel and non-Southern licensees cannot accommodate these other licensees, with "comparable facilities" without use of the 1.9 GHz or some other frequencies by non-Nextel and non-Southern licensees.

If Nextel would vacate channels 441-600 to accommodate non-Nextel BEA licensees, all but BEA 174 could be accommodated in these 160 channels. BEA 174 has non-Nextel licensees having 265 channels. To accommodate these non-Nextel BEA licensees Nextel would have to provide additional spectrum by relinquishing some of the channels in the 601-720 channel range in the 800 MHz band and the remainder in a portion of the 1.9 GHz band. These would be used by non-Nextel BEA licensees in BEA 174.

However, there will be a deficit of site-specific channels for Cities in BEA 174 which will require Nextel to relinquish additional channels in the 800 MHz or 1.9 GHz band.

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CONCLUSIONS

1. After a careful review of the data and examination of the concepts set forth in the Rebanning Orders, the approach to be taken for reconfiguring the 800 MHz band cannot be accomplished and provide “comparable facilities” to all licensees. Even if all incumbents were short-spaced a number of Cities will still suffer spectrum shortage.
2. In many of the 578 Cities examined the number of site-specific licensed channels to remain in channels 121-400 and those to be relocated to these channels exceed the 280 channels available and therefore cannot provide “comparable facilities” including required spectrum and “coextensive geographic coverage”.
3. In 24 of the largest 100 U.S. Cities full access to the 2.5 MHz to be used by public safety after being vacated by Nextel is not possible and 11 of these Cities cannot have any access to these 2.5 MHz and have a deficit instead.
4. The two (2) MHz given up by Nextel in the Upper 200 Block is to form a Guard Band where interference can occur and therefore is not suitable for Public Safety operations.
5. Additional spectrum is needed to provide for public safety interoperability, particularly in larger Cities, to aid in coping with terrorist and natural disasters. For example Boston, MA, Miami, FL, and San Juan, PR can be vulnerable to natural disasters from hurricanes or storms in the Atlantic Ocean and have a shortage of public safety frequencies.
6. Coordination is required to ensure that co-channel interference will not be a problem in channels 121-400 after reconfiguration occurs.
7. Relocation of *BEA* licensees to the *ESMR* portion of the band, with Nextel having exclusive use of the upper six (6) MHz of the band, does not provide sufficient spectrum for the non-Nextel *BEA* licensees. Additional spectrum is therefore required to provide the *BEA* licensees, with “comparable facilities”.
8. Exclusive use of the vacated *NPSPAC* channels provides Nextel with better-than “comparable facilities” because they will obtain a block of contiguous unencumbered channels.
9. Regional interoperability must be maintained during the reconfiguration. It is imperative that frequency reconfiguration of agencies requiring regional interoperability occur simultaneously even if the agencies are in different Waves.
10. Regional interoperability cannot be maintained unless simultaneous frequency reconfiguration of the involved agencies occurs.

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11. There is not sufficient spectrum to accommodate every licensee affected by the relocation. Therefore, contrary to claims, the Rebanding Orders do not provide each licensee with "comparable facilities" including "coextensive geographical coverage", and
12. There is not sufficient spectrum available after rebanding to support public safety receiving and additional 2.5 MHz of 800 MHz spectrum in every City.

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RECOMMENDATIONS

1. The frequency boundary between the non-Cellular Block and *ESMR* portions of the revamped 800 MHz band should be flexible and allow for accommodation of all existing site-specific licensees.
2. The exclusive use of the upper portion of the *ESMR* portion of the 800 MHz band should therefore not be granted to Nextel at the expense of other BEA licensees.
3. As an alternative, Nextel could vacate a sufficient number of channels in each *BEA* to accommodate non-*Nextel BEA* licensees in the 817/862–824/869 MHz band, or non-*Nextel BEA* licensees could be given equivalent spectrum in the 10 MHz of the 1.9 GHz band. In the case of BEA 174 access to the 1.9 GHz band should be granted to accommodate the *BEA* channels which can not be accommodated in the 800 MHz band.
4. Frequency reconfiguration of agencies requiring regional interoperability should occur simultaneously.
5. Reinstate frequency coordination to ensure that Public Safety, Business, Industrial and Land Transportation and *SMR* Site-Licensed Channels receive comparable facilities.

Table 2 - Channel Deficit or Surplus for All Cities Over 50,000 Population

City Name	S t a t e #	City Center		Non-NexTEL Site-Specific Incumbent Channels within			Non-NexTEL Site-Specific Licensed Channels Move-in within						NexTEL Site-Specific Licensed Channels within			Site-Specific Channel Deficit or Surplus within Channels 121-400			
				35 mi radius *	50 mi radius *	70 mi radius *	35 mi radius *	50 mi radius *	70 mi radius *	35 mi radius *	50 mi radius *	70 mi radius *	35 mi radius *	50 mi radius *	70 mi radius *				
		Longitude	Latitude	Chan 121-400	Chan 121-400	Chan 121-400	Chan 001-120	Chan 401-600	Chan 001-120	Chan 401-600	Chan 001-120	Chan 401-600	Chan 121-400	35 mi radius *	50 mi radius *	70 mi radius *	35 mi radius *	50 mi radius *	70 mi radius *
Richmond	CA	163	-122.343	37.9553	150	156	171	33	0	40	0	46	0	145	151	169	97	84	63
Salinas	CA	163	-121.638	36.6865	102	139	166	12	0	27	0	42	0	133	150	170	166	114	72
San Francisco	CA	163	-122.447	37.8183	152	158	173	32	0	40	0	47	0	143	148	169	96	82	60
San Jose	CA	163	-121.875	37.297	160	164	175	36	0	42	0	50	0	150	159	175	84	74	55
San Leandro	CA	163	-122.166	37.7046	146	167	174	35	0	43	0	48	0	136	163	169	99	70	58
San Mateo	CA	163	-122.316	37.5565	152	158	174	34	0	39	0	48	0	136	146	168	94	83	58
San Rafael	CA	163	-122.514	37.9823	136	155	170	29	0	41	0	45	0	144	149	168	115	84	65
Santa Clara	CA	163	-121.968	37.3709	148	164	171	34	0	41	0	47	0	138	159	169	98	75	62
Santa Cruz	CA	163	-122.036	36.9759	112	160	167	24	0	36	0	42	0	135	152	166	144	84	71
Santa Rosa	CA	163	-122.676	38.4521	89	147	162	10	0	30	0	42	0	142	147	155	181	103	76
South San Francisco	CA	163	-122.346	37.6534	151	158	174	37	0	39	0	49	0	136	149	168	92	83	57
Stockton	CA	163	-121.289	37.9728	98	162	199	18	0	33	0	50	0	162	179	189	164	85	31
Sunnyvale	CA	163	-122.024	37.3972	152	164	171	34	0	42	0	47	0	138	159	168	94	74	62
Tracy	CA	163	-121.428	37.7291	113	159	179	25	0	35	0	50	0	149	167	182	142	86	51
Union City	CA	163	-122.019	37.6007	152	166	174	34	0	44	0	49	0	136	162	171	94	70	57
Vacaville	CA	163	-121.965	38.3631	119	161	175	25	0	33	0	49	0	142	163	175	136	86	56
Vallejo	CA	163	-122.231	38.1146	148	160	176	29	0	38	0	50	0	146	154	170	103	82	54
Walnut Creek	CA	163	-122.04	37.8942	154	171	174	34	0	45	0	49	0	138	163	172	92	64	57
Davis	CA	164	-121.735	38.5556	102	155	177	11	0	36	0	50	0	146	162	180	167	89	53
Folsom	CA	164	-121.149	38.6747	116	142	202	8	0	20	0	48	8	162	170	192	156	118	22
Roseville	CA	164	-121.288	38.7627	121	147	194	10	0	20	0	48	0	146	168	190	149	113	38
Sacramento	CA	164	-121.462	38.5604	102	156	177	6	0	27	0	49	0	146	172	182	172	97	54
Redding	CA	165	-122.363	40.5819	50	60	89	1	0	6	0	7	0	101	113	114	229	214	184
Eugene	OR	166	-123.121	44.0498	46	68	94	8	0	11	0	20	0	140	144	179	226	201	166
Medford	OR	166	-122.846	42.3453	52	55	67	7	0	7	0	11	0	86	90	109	221	218	202
Beaverton	OR	167	-122.814	45.4828	135	149	169	29	0	39	0	40	0	145	158	188	116	92	71
Gresham	OR	167	-122.433	45.5111	131	153	170	35	0	38	0	39	0	138	162	185	114	89	71
Hillsboro	OR	167	-122.935	45.5318	126	149	167	24	0	39	0	41	0	148	162	185	130	92	72
Portland	OR	167	-122.654	45.5429	135	148	169	35	0	39	0	40	0	144	162	185	110	93	71
Salem	OR	167	-123.028	44.933	116	156	186	18	0	36	0	45	0	148	180	184	146	88	49
Vancouver	WA	167	-122.661	45.6461	130	147	164	35	0	39	0	40	0	144	158	186	115	94	76
Yakima	WA	169	-120.529	46.5947	38	98	169	9	0	13	0	16	0	112	123	138	233	169	95
Bellevue	WA	170	-122.151	47.5999	70	84	110	89	14	93	26	95	30	177	191	199	107	77	45
Bellingham	WA	170	-122.459	48.7476	10	14	48	43	21	70	24	98	31	85	113	124	206	172	103
Everett	WA	170	-122.228	47.9607	37	75	110	93	24	95	32	101	34	117	176	198	126	78	35
Federal Way	WA	170	-122.349	47.3078	74	83	105	87	14	92	16	93	26	188	196	200	105	89	56
Seattle	WA	170	-122.342	47.613	77	84	99	91	14	93	26	95	32	180	195	199	98	77	54
Tacoma	WA	170	-122.461	47.2494	46	83	110	87	14	92	16	92	25	188	193	202	133	89	53
Anchorage	AK	171	-149.44	61.1089	164	170	171	73	147	73	152	73	152	0	0	0	(104)	(115)	(116)
Honolulu	HI	172	-157.804	21.3283	101	101	111	30	0	30	0	38	0	130	130	141	149	149	131
Bayamon	PR	174	-66.1595	18.3804	176	177	181	57	134	57	139	63	139	64	64	64	(87)	(93)	(103)
Caguas	PR	174	-66.0419	18.2372	173	176	183	56	134	57	134	73	144	64	64	69	(83)	(87)	(120)
Carolina	PR	174	-65.981	18.406	154	176	183	56	114	57	134	68	144	64	64	69	(44)	(87)	(115)
Guayanabo	PR	174	-66.1152	18.3866	176	176	183	56	134	57	134	73	144	64	64	69	(86)	(87)	(120)
Mayaguez	PR	174	-67.1358	18.2018	84	91	159	14	75	15	80	62	104	34	63	64	107	94	(45)
Ponce	PR	174	-66.6196	17.9997	148	178	181	62	99	63	109	63	139	64	64	64	(29)	(70)	(103)
San Juan	PR	174	-66.0605	18.4049	173	176	183	56	134	57	134	73	144	64	64	69	(83)	(87)	(120)

* From center of the City